Small Business Innovation Research/Small Business Tech Transfer

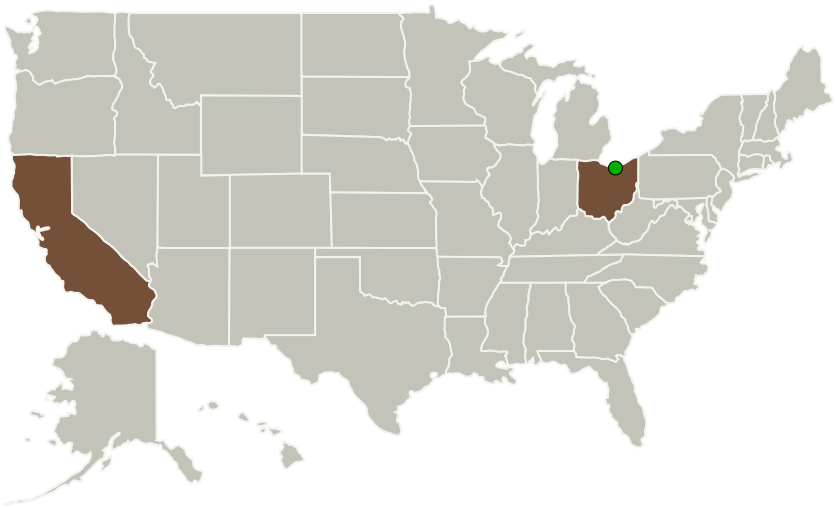
Injector-Integrated Fuel-Air Heat Exchanger Module, Phase I

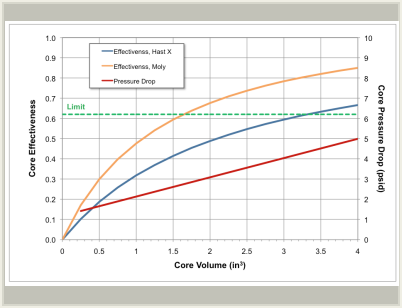
Completed Technology Project (2016 - 2016)

Project Introduction

Modern high efficiency gas turbine engines typically operate with hot section temperatures so high that metal parts in those areas need to be cooled to maintain strength and life properties. A well-established approach to this bleeds a portion of the compressor discharge air to flow through and over turbine parts. As engine compressor pressure ratios continue to increase, the temperature of this compressor discharge air also increases, to the point that the cooling air itself needs to be cooled. Micro Cooling Concepts is involved in developing a concept for a heat exchanger co-located/integrated near the point of fuel injection in order to provide cooled cooling air. The main advantages of this concept are the minimization of the amount of heated fuel between the heat exchanger and fuel injector tip such that the fire danger from leaking tubing is eliminated, and the ease of delivering cooled cooling air to the secondary air circuit. Additionally, the modular concept distributes the heat exchange function, allowing for easy replacement of an individual heat exchanger module. For this program, high temperature materials will be used for fabrication using Micro Cooling Concepts' laminated foil construction approach. This effort supports the NASA goal of improving aeropropulsive efficiency through reduced fuel burn and increased cycle temperatures, specifically by enabling very high turbine cooling effectiveness.

Primary U.S. Work Locations and Key Partners





Injector-Integrated Fuel-Air Heat Exchanger Module, Phase I

Table of Contents

Injector-Integrated Fuel-Air Heat Exchanger Module, Phase I

Completed Technology Project (2016 - 2016)

Organizations Performing Work	Role	Type	Location
Micro Cooling Concepts, Inc.	Lead Organization	Industry Veteran-Owned Small Business (VOSB)	Huntington Beach, California
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
California	Ohio

Project Transitions

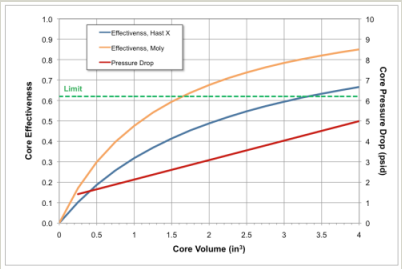
June 2016: Project Start

December 2016: Closed out

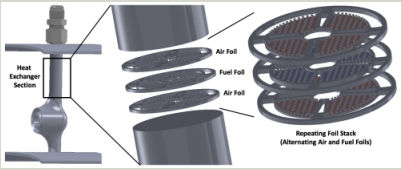
Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139640)*

Images



Briefing Chart Image
Injector-Integrated Fuel-Air Heat Exchanger Module, Phase I *(https://techport.nasa.gov/image/127838)*



Final Summary Chart Image
Injector-Integrated Fuel-Air Heat Exchanger Module, Phase I Project Image *(https://techport.nasa.gov/image/134570)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Micro Cooling Concepts, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

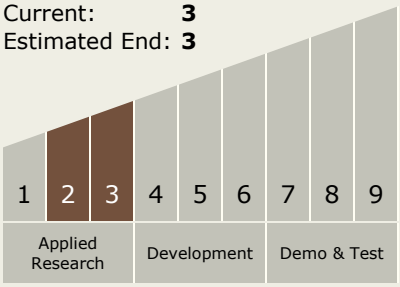
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
David Underwood

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



Injector-Integrated Fuel-Air Heat Exchanger Module, Phase I

Completed Technology Project (2016 - 2016)

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.2 Thermal Control Components and Systems
    - TX14.2.3 Heat Rejection and Storage

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System